Before the

FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	
Amendment of Parts 15, 73 and 74 of the Commission's Rules to Provide for the Preservation of One Vacant Channel in the UHF Television Band for Use by White Space Devices and Wireless Microphones	MB Docket No. 15-146
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	GN Docket No. 12-268

REPLY COMMENTS OF MICROSOFT CORPORATION

Paula Boyd
Director, Government Relations
and Regulatory Affairs

Michael Daum
Technology Policy Strategist

MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001

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I. INTRODUCTION AND SUMMARY.

The Commission has heard from a diverse group of carriers, equipment manufacturers, software companies, public interest organizations, and Wi-Fi service providers in this proceeding. These comments reveal widespread support for the Commission's vacant-channel proposals, and demonstrate why they are critical to delivering the tremendous consumer benefits of unlicensed spectrum to the TV bands, protecting the rights of incumbents, and promoting a successful auction.[1] Although this group of commenters has disagreed in past proceedings about the precise rules for unlicensed operations in these bands, their consensus on the Commission's vacant-channel proposals serves as a valuable reminder of the fundamental importance of unlicensed spectrum to a diverse array of consumers and businesses.

The record also makes it clear that there are no legal impediments to adoption of the Commission's vacant-channel proposals. The Commission's proposals simply exercise the Commission's well-established powers under the Communications Act. Contrary claims by the National Association of Broadcasters ("NAB") and other broadcast television interests

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[1] *See* Comments of Competitive Carriers Association, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("CCA Comments"); Comments of the Consumer Electronics Association, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("CEA Comments"); Comments of Google Inc., MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("Google Comments"); Comments of Microsoft Corp., MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("Microsoft Comments"); Comments of Open Technology Institute at New America and Public Knowledge, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("OTI/PK Comments"); Comments of Sennheiser Electronic Corporation, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("Sennheiser Comments"); Comments of Shure Inc., MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("Shure Comments"); Comments of T-Mobile USA, Inc., MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("T-Mobile Comments"); Comments of Wi-Fi Alliance, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("Wi-Fi Alliance Comments"); Comments of the Wireless Internet Service Providers Association, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015) ("WISPA Comments").

fundamentally misunderstand the Commission's rules, exaggerate the burdens of the Commission's proposals on broadcasters, and turn a blind eye to the tremendous value of the unlicensed ecosystem. Comments from non-broadcasters overwhelmingly support the Commission's conclusion that the consumer benefits of a healthy unlicensed ecosystem in low-band spectrum greatly outweigh the light burden on broadcasters. The Commission should therefore implement its vacant-channel proposals, along with small but important improvements described in the comments to further the Commission's goal of expanding the availability of wireless broadband nationwide.

II. THE COMMUNICATIONS ACT AND THE SPECTRUM ACT EMPOWER THE COMMISSION TO ADOPT ITS VACANT-CHANNEL PROPOSALS FOR ALL CLASSES OF BROADCASTERS.

As Microsoft and numerous other commenters have observed, the Commission has the legal authority to adopt a vacant-channel-showing requirement for LPTV and TV translators immediately, and for Class A and full-power stations during and after the repack process.[2] Indeed, it had the authority for this action even before passage of the Spectrum Act, under §§ 303, 307-309, and 316 of the Communications Act.[3] Not only does the Spectrum Act explicitly preserve this authority,[4] it also endorses the Commission's prior policy decision to make TV white spaces available for unlicensed uses.[5] Broadcasters' assertions that the vacant-channel

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2 CCA Comments at 3; CEA Comments at 11; Google Comments at 7; Microsoft Comments at 6; OTI/PK Comments at 2; Shure Comments at 10; T-Mobile Comments at 4; WISPA Comments at 4.

3 *See* 47 U.S.C. §§ 303(b), (r) & 316(a)(1).

4 *Middle Class Tax Relief and Job Creation Act of 2012*, Pub. L. No. 112-96, § 6403(i)(1), 126 Stat. 156, 226 (2012) ("Spectrum Act").

5 *Id*. § 6403(i)(2).

proposals are somehow contrary to the Spectrum Act or the Communications Act[6] are simply mistaken.

Under the Communications Act, and a long history of judicial decisions, the Commission has "broad authority to manage spectrum . . . in the public interest."[7] In addition to this mandate, the Communications Act empowers the Commission to impose conditions on the issuance of licenses for new broadcast applicants and those seeking to modify their existing facilities, to ensure that these licenses serve the "public interest, convenience, and necessity."[8] As long as the Commission determines that preservation of vacant channels for unlicensed use serves the public interest, this authority empowers the Commission to require all types of broadcasters to show that their new or modified operations will not consume the last remaining vacant channels.

Some commenters have suggested that Part 15's prohibition on harmful interference by unlicensed operations to licensed services, 47 U.S.C. § 15.5(b), somehow also bars the Commission from protecting a small amount of spectrum for unlicensed use.[9] But this argument fundamentally misunderstands the rules. Part 15.5(b) provides that:

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6 *See, e.g.*, Comments of DTV America Corp. at 2, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 29, 2015); Comments of the LPTV Spectrum Rights Coalition, LLC at 2-11, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30); Comments of Mako Communications, LLC at 2-5, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015); Comments of the National Association of Broadcasters at 3-4, 8-10, GN Docket No. 12-268, WT Docket No. 12-269, AU Docket No. 14-252, and MB Docket No. 15-146 (filed Sept. 30, 2015) ("NAB Comments"); Comments of Sinclair Broadcast Group Inc. at 2-5, GN Docket No. 12-268, WT Docket No. 12-269, AU Docket No. 14-252, and MB Docket No. 15-146 (filed Sept. 30, 2015).

7 *Cellco P'ship v. FCC*, 700 F.3d 534, 541 (D.C. Cir. 2012) (citing *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services*, Second Report and Order, FCC 11-52, 26 FCC Rcd. 5411, 5440 ¶ 62 (2011)).

8 *See also* 47 U.S.C. § 309(a). *See also id.* §§ 307-308.

9 *See, e.g.,* NAB Comments at 3-4.

> Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.[10]

The language of this rule is clear: Part 15.5 addresses harmful interference caused by and to unlicensed devices operating within the bands designated for unlicensed use. It says nothing about when the Commission may or may not consider designating a new band for unlicensed use. In fact, there is *no* provision of the Communications Act, the Spectrum Act, the Commission's rules, or any other law that prevents the Commission from making the policy decision that a particular band should be reserved for unlicensed use, and not available for a particular licensed service.

If this were not the case, it is difficult to understand how the Commission could legally have created any unlicensed bands at all. The decision to designate any band for unlicensed use necessarily includes a decision *not* to allocate that band for other, inconsistent, licensed uses. But this has not stopped the Commission from promoting innovation in wireless broadband by making a limited number of bands available for unlicensed use in, e.g., the 2.4 GHz and 5 GHz unlicensed bands. The Commission has no less power to do so in the TV bands.

The Commission's authority to regulate—and, if necessary, displace—the subset of broadcasters comprising low-power TV and TV translator stations is even broader. As well as including the Commission's broad licensing powers described above, the Commission's rules make clear that the Commission may displace low-power TV and TV translators by altering the channel allotments for a market, or by authorizing new full-power broadcasters:

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[10] 47 C.F.R. § 15.5(b).

> Changes in the TV Table of Allotments or Digital Television Table of Allotments, authorizations to construct new TV broadcast analog or DTV stations or to authorizations to change facilities of existing such stations, may be made *without regard to existing or proposed low power TV or TV translator stations.* [11]

Congress and the Commission provided LPTV stations ample opportunity to obtain more robust legal protections by converting to Class A stations.[12] For licensees who decided not to convert, however, it has long been clear that an "uncertain" regulatory future is the price to be paid for LPTV's minimal regulatory obligations—whether due to displacement by full-power stations, the digital TV transition, or unlicensed operations.[13] While the Commission's broad authority over licensing and spectrum policy is sufficient for it to adopt its vacant-channel proposals, the rules governing LPTV and TV translators make the Commission's authority even clearer in this context.

This legal authority stems from rules and statutes adopted well before the passage of the Spectrum Act. Thus, whatever rights LPTV has, they clearly do not include the right to be shielded from displacement by "[c]hanges in the TV Table of Allotments or Digital Television Table of Allotments."[14] The Commission's vacant-channel proposals therefore do not "alter the spectrum usage rights of low-power television stations."[15] Rather, they are authorized by limitations on those spectrum-usage rights that well predate the Spectrum Act. In short, NAB is correct that, today, "a displaced translator or LPTV station could inarguably apply to the

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11 *See* 47 C.F.R. § 74.702(b) (emphasis added).

12 *See* 47 U.S.C. § 336(f).

13 *See* Section-by-Section Analysis to S. 1938; *Establishment of A Class A Television Serv.*, 15 F.C.C. Rcd. 6355, 6358 (2000).

14 47 C.F.R. § 74.702(b).

15 Spectrum Act § 6403(b)(5).

Commission for authority to operate on an available, unused channel in the broadcast television band."[16] But it overlooks the fact that LPTV will also be able to do so after the Incentive Auction. The only limitation—a limitation that already exists today—is that there is no guarantee that a suitable channel will exist wherever an LPTV station seeks to operate.

Finally, NAB's assertion that the Commission has not adequately justified its vacant-channel proposals in light of previous decisions declining to preserve broadcast spectrum for unlicensed use[17] is incorrect. To be sure, for any decision, the Commission must provide a reasoned explanation based on evidence on the record. However, the law affords the Commission great deference in making such decisions, since they "require[] expert policy judgment of a technical, complex, and dynamic subject."[18] This is true for both initial decisions, and decisions revisiting prior policy choices. Contrary to NAB's claims,[19] there is no heightened review for a decision that represents a change of course. The Commission need only "display awareness that it *is* changing position."[20] "[I]t suffices that the new policy is permissible under the statute, that there are good reasons for it, and that the agency *believes* it to be better, which the conscious change of course adequately indicates."[21]

Here, the Commission has explained its position, and acknowledged the respects in which its vacant-channel proposals diverge from previous policy choices.[22] The Commission has

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16 NAB Comments at 9.

17 *See* NAB Comments at 5-8.

18 *Cablevision Sys. Corp. v. FCC*, 597 F.3d 1306, 1311 (D.C. Cir. 2010).

19 *See* NAB Comments at 5.

20 *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

21 *Id*.

22 *See Amendment of Parts 15, 73 and 74 of the Commission's Rules to Provide for the Preservation of One Vacant Channel in the UHF Television Band for Use By White Space*

specifically concluded that the benefits of stimulating the growth of an unlicensed ecosystem in the 600 MHz band are worth the reasonable and limited burden of its proposals to broadcast licensees,[23] and this decision finds copious support in the record. Numerous parties have illustrated the value of Wi-Fi and unlicensed spectrum, and making additional low-band spectrum available for unlicensed use will greatly improve upon this success by alleviating congestion in urban cores, while simultaneously improving rural coverage.[24] The primary impediment to the rapid adoption of this technology remains—as it has been since the Commission originally authorized white-space unlicensed operations—regulatory uncertainty.[25] Chipmakers may not make the investments needed to support a healthy 600 MHz unlicensed ecosystem if it is not certain that sufficient 600 MHz spectrum will be available for unlicensed

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Devices and Wireless Microphones, Notice of Proposed Rulemaking, FCC 15-68, 30 FCC Rcd. 6711, ¶ 19 (2015) ("NPRM").

[23] *Id.* ¶ 10-11.

[24] Reply Comments of IEEE 802, ET Docket No. 12-268 (filed Mar. 12, 2013). See also CCA Comments at 1; CEA Comments at 3; Google Comments at 2; NAB Comments at ii; OTI/PK Comments at 2; Sennheiser Comments at 3; T-Mobile Comments at 2; Wi-Fi Alliance Comments at 2; Letter from Paul Margie, Counsel for Google Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268 and ET Docket No. 14-165 (filed June 2, 2015); Reply Comments of Microsoft Corp. at 3, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 25, 2015); Comments of Google Inc. at 51, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Comments of Microsoft Corp. at 2, ET Docket No. 14-165 and GN Docket No. 12-268 (filed Feb. 4, 2015); Letter from Paul Margie, Counsel for Broadcom Corp., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268 (filed Sept. 25, 2014); Letter from Paul Margie, Counsel for Google Inc. and Microsoft Corp., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268 (filed Sept. 19, 2014); Letter from S. Roberts Carter, Counsel for Broadcom Corp., to Marlene H. Dortch, Secretary, FCC, at 1, GN Docket No. 12-268 (filed Apr. 23, 2014).

[25] *See* Microsoft Comments at 2-6.

use after the Incentive Auction. The Commission crafted its vacant-channel proposals to address precisely this problem.[26]

As Microsoft has noted,[27] the likely congestion in the TV bands in metro areas like Los Angeles and New York City means that channels will be scarce in the most desirable areas for unlicensed devices—and the places that would stand to benefit the most from additional unlicensed spectrum. The Commission's efforts to limit interference to future wireless licensees by placing a broadcaster in the duplex gap in some markets (likely including Los Angeles), and the substantial uncertainty surrounding operation in channel 37 after the Commission's Part 15 order,[28] exacerbate this problem. In fact, without the Commission's vacant-channel proposal, there will likely be too few channels available for white-space devices in critically important urban areas, including much of Los Angeles, for an unlicensed market to develop in the post-auction TV bands.

III. THE BENEFITS OF THE COMMISSION'S VACANT-CHANNEL PROPOSALS VASTLY OUTWEIGH THE BURDENS ON BROADCASTERS.

While the benefits of expanding unlicensed broadband access through the Commission's vacant-channel proposals are enormous, the burden this policy would create for broadcasters would be small and fully justified, as the Commission correctly has concluded.[29] The large majority of LPTV and translator stations exist in rural areas where many white spaces will exist

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26 NPRM ¶ 10 n. 26.

27 *See* Microsoft Comments at 2-6.

28 *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, ET Docket No. 14-165, and GN Docket No. 12-268, Report and Order, FCC 15-99, ¶ 221 (2015) ("Part 15 Order").

29 *See* NPRM ¶ 11.

after the auction. In these markets, the vacant channels that remain after the repack will likely be sufficient to satisfy the vacant-channel showing with no burden on broadcasters (including LPTV) beyond generating a report from the spectrum database. The burden of adding the vacant-channel showing to an FCC filing that the license would already have to submit is *de minimis*.

As NAB points out, TV translators typically exist in areas like rural New Mexico.[30] Due to the mountainous terrain in rural New Mexico, some New Mexicans receive over-the-air programming from TV translators that rebroadcast programming from full-power broadcasters in Albuquerque and other urban areas. These translators naturally operate outside the area served by the full-power broadcasters themselves. But this also means that, by definition, TV translators will tend to operate in areas where the TV bands are largely vacant and, accordingly, where the Commission's vacant-channel proposals will have little effect.

The availability of a substantial number of white spaces in New Mexico today confirms this. According to white-spaces spectrum databases,[31] nearly all of New Mexico outside the contours of the Albuquerque full-power stations have access to between 9 and 45 white spaces, with at least 8 available throughout Albuquerque itself. With this many vacant channels available today, it appears likely that sufficient spectrum will remain available for every TV translator operating there to successfully make the vacant-channel showing and remain in operation after

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30 *See* NAB Comments at 14-18.

31 *See, e.g.* Google, SPECTRUM DATABASE, https://www.google.com/get/spectrumdatabase/. The Google Spectrum Database does not yet reflect the Commission's recent Part 15 rule changes which, in rural areas, will likely increase the spectrum availability for white-space devices, further reducing the burden of the vacant-channel showing on TV translators. Unsurprisingly, other than the exclusion zone around the Very Large Array radioastronomy site, the very limited areas where fewer vacant channels are available are constrained due to their proximity to full-power broadcasters, and are therefore also areas where TV translators are unlikely to operate.

the Incentive Auction. The situation is similar in rural Oregon and rural Arizona, the areas that Meredith highlights.[32] Outside the contours of the full-power stations serving urban areas—where TV translators are likely to operate—there are more than 9 channels available statewide in these states as well.[33]

LPTV and TV translator station owners and operators also overlook the potentially significant role of channel-sharing in increasing spectral efficiency and easing spectrum constraints for these broadcasters. The Commission has tentatively concluded that this option should be made available to LPTV and TV translators specifically in order to "help to mitigate the impact of the auction and repacking process."[34] In addition, low-power interests ignore the Commission's decision to open up the first available channels above and below channel 37—spectrum that was previously available only for wireless microphones. The new availability of this spectrum will offer additional flexibility for operations in the 600 MHz band. While the availability of these channels (which will vary depending on the spectrum recovery scenario) will not be sufficient to guarantee adequate spectrum for unlicensed use in every market, the availability of these channels will significantly reduce the number of LPTV and TV translator stations that will be displaced as a result of the Commission's vacant-channel proposal. In fact, in markets where channels formerly set aside for wireless microphones remain unoccupied after

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[32] Letter from Joshua Pila, General Counsel, Local Media Group, Meredith Corporation, to Marlene Dortch, Secretary, FCC, GN Docket No. 12-268 (filed Oct. 15, 2015).

[33] *See supra* n. 31.

[34] *Amendment of Parts 73 and 74 of the Commission's Rules to Establish Rules for Digital Low Power Television and Television Translator Stations*, MB Docket No. 03-185, ET Docket No. 14-175, and GN Docket No. 12-268, Third Notice of Proposed Rulemaking, FCC 14-151, ¶ 14 (Rel. Oct. 10, 2014).

the auction, broadcasters need not even change channels to preserve these channels for white-space devices—they will already be vacant.

These factors ensure that the vacant-channel proposal will have minimal impact on educational programming, for the same reasons that they will have minimal impact on LPTV in general. In addition to these safeguards, however, Microsoft supports Public Television's proposal to give educational low-power stations displacement priority after the auction.[35] By allowing these stations to relocate before other low-power broadcasters, in combination with rules to avoid the loss of a market's last remaining full-power educational broadcaster, the Commission can further reduce—if not eliminate—even the small impact of the repack on the availability of educational programming.

In urban areas, the impact on LPTV and TV translators will also be limited, not because spectrum will always be plentiful, but because urban areas are home to relatively fewer LPTV and especially TV translator stations. At the same time, these are precisely the areas where the vacant-channel proposal will be most valuable to consumers and the unlicensed ecosystem.[36] No less valuable than the available spectrum itself will be the certainty that the vacant-channel proposal promotes in the availability of adequate unlicensed spectrum after the auction in the most important—but also most constrained—markets.

For full-power and Class A stations, the vacant-channel showing will have only a modest effect in *any* area. The Commission has proposed significant concessions to the needs of these broadcasters, and is considering several more. The Commission is considering rules that will

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[35] Comments of the Public Broadcasting Service, Association of Public Television Stations, and Corporation for Public Broadcasting at 6, MB Docket No. 15-146 and GN Docket No. 12-268 (filed Sept. 30, 2015).

[36] *See supra* 7-8.

place no limitations on full-power and Class A broadcasters' abilities to continue operating with their existing facilities, allow them flexibility in modifying facilities during the transition,[37] and even allow them to make facility modifications after the close of the post-repack transition period if it was not possible to do so in a timelier fashion.[38] Otherwise, however, it is crucial that the Commission limit these exceptions to modifications *during* the transition period, and require the vacant-channel showing of broadcasters that seek to modify or construct new facilities after this period ends. This is necessary to promote the certainty needed to stimulate investment in the white-spaces ecosystem, and is consistent with the FCC's legal authority, as discussed in § II, above. The significant benefits to consumers of expanding wireless broadband by supporting a healthy unlicensed ecosystem in the 600 MHz band far outweigh these limited burdens on these broadcasters.

IV. MINOR ADJUSTMENT TO THE COMMISSION'S IMPLEMENTATION OF THE VACANT-CHANNEL PROPOSALS COULD IMPROVE ITS EFFECTIVENESS.

Microsoft agrees with the technical improvements to the vacant-channel showing proposed by Consumer Electronics Association ("CEA").[39] First, CEA points out that making the vacant-channel showing at the geographic center of each 2km-by-2km cell risks overlooking significant population centers. It is likely that, nationwide, many population centers will fall between these geographic centerpoints, leaving populations with inadvertently diminished access to unlicensed spectrum, and sowing uncertainty. Fortunately, however, this problem is easily resolved by using the same grid that the Commission already used for its interservice

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[37] NPRM ¶¶ 20, 27-28.

[38] NPRM ¶ 23, 29.

[39] *See* CEA Comments 6-9.

interference analysis, which relies on the population-weighted centroids of each 2km-by-2km cell, instead of their geographic centers.

Because the Commission has already calculated these locations, it can simply provide these coordinates to licensees, applicants, and database operators, eliminating the need for applicants to calculate these locations themselves. While any grid-based methodology will be imperfect, requiring broadcast applicants to make the vacant-channel showing at the population-weighted centroid will increase the accuracy of the vacant-channel showing and promote its ultimate goal of ensuring nationwide consumer access to unlicensed white spaces.

Adopting the fixed, nationwide grid used for the interservice interference analysis would also have the benefit of preventing manipulation of the vacant-channel showing by applicants' selection of a favorable grid orientation. If the grid is not fixed nationwide, it will be natural for broadcast applicants to adopt grid orientations that produce biased views of the true availability of vacant white spaces in their service areas. This will be unfair to other broadcasters, and disadvantage consumers whose available white-space spectrum is reduced as a result of these manipulations. This sort of uncertainty could also chill prospective investment in white-space technologies.

Finally, CEA rightly points out that the Commission should revise its criteria for when a broadcaster must make the vacant-channel showing for a given 2km-by-2km area.[40] The Commission's proposed approach would exempt a broadcaster from making the showing for any 2km-by-2km area that is partially covered by its existing contour. Microsoft agrees that licensees should not be required to make the showing for areas *entirely* included within the applicant's existing contour. However, for areas only partially covered by the existing contour, it is

[40] CEA Comments at 6-9.

important that the applicant be required to make the vacant-channel showing. Otherwise, exemption from the vacant-channel showing could permit a broadcast applicant to eliminate the final vacant channel for populations in the portions of these cells who live outside the broadcaster's contour. Given the size of the grid cells, these populations could be significant, especially where the applicant's existing contour overlaps the cell only minimally. Altering this proposal to exempt only cells that are entirely covered by the existing contour will impose no additional burden on broadcast applicants while significantly improving the availability of unlicensed white-space spectrum for consumers.

V. CONCLUSION.

Microsoft joins a large and diverse array of parties in strong support of the Commission's vacant-channel proposals. The proposed rules strike the right balance between serving the interests of full- and low- power broadcasters, and making unlicensed broadband services possible in the post-auction bands—and the FCC has clear legal authority to enact these rules. With the minor adjustments suggested in these comments, the preservation of one (or, in certain markets, two) vacant channels for unlicensed will serve a crucial role in ensuring that unlicensed operations can thrive in the 600 MHz and TV bands.

Respectfully submitted,

/s/ Paula Boyd

Paula Boyd
Director, Government Relations and Regulatory Affairs
Michael Daum
Technology Policy Strategist
MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001
(202) 263-5900